STN Columbus

```
=> d his

     (FILE 'HOME' ENTERED AT 14:14:51 ON 18 FEB 2004)
     FILE 'CA' ENTERED AT 14:15:00 ON 18 FEB 2004
                E HOSOKAWA K/AU
L1          103 S E3,E24
                E FUJII T/AU
L2          863 S E3,E137
                E ENDO I/AU
L3          649 S E3,E17
L4            9 S L1 AND L2 AND L3
L5           18 S (L1 AND L2)OR(L1 AND L3)OR(L2 AND L3)
L6            9 S L1-3 AND MICROFLUID?
L7           25 S L4-6

=> d bib,ab 1-25 l7
```

L7 ANSWER 19 OF 25 CA
AN 133:67923 CA
TI Droplet-based nano/picoliter mixer using hydrophobic microcapillary vent
AU **Hosokawa, Kazuo; Fujii, Teruo; Endo, Isao**
CS Biochemical Systems Laboratory, The Institute of Physical and Chemical Research (RIKEN), Wako, 351-0198, Japan
SO IEEE International Conference on Micro Electro Mechanical Systems, Technical Digest, 12th, Orlando, Fla., Jan. 17-21, 1999 (1999), 388-393 Publisher: Institute of Electrical and Electronics Engineers, New York, N. Y.
AB A mixing device for liq. droplets with pL-nL vol. was developed for the 1st time. Two droplets with vol. of 5 nL were pneumatically manipulated and joined together in a microchannel. For drawing off the air between two droplets, Hydrophobic Microcapillary Vent (HMCV)-a vent valve driven by the neg. capillary action-was used. The mixer can be used as a diffusion-based optical chem. detector, or as a basic component in integrated multistep Micro Total Anal. Systems (μTAS). Since the mixer has planar structure without moving parts, it can be fabricated by molding technique at low cost.

L7 ANSWER 21 OF 25 CA
AN 131:251773 CA
TI Handling of Picoliter Liquid Samples in a Poly(dimethylsiloxane)-Based **Microfluidic** Device
AU **Hosokawa, Kazuo; Fujii, Teruo; Endo, Isao**
CS Biochemical Systems Laboratory, Institute of Physical and Chemical Research (RIKEN), Wako-shi Saitama, 351-0198, Japan
SO Analytical Chemistry (1999), 71(20), 4781-4785
AB Transportation, metering, and mixing of picoliter-sized liq. samples were realized in a **microfluidic** device with a main working area of one square millimeter. The device was constructed by sealing microfabricated grooves on a chip made of poly(dimethylsiloxane) (PDMS). Two different samples were segmented into 600-pL droplets in a microchannel with a cross section of W (100 μm) × H (25 μm), and the droplets were merged together. For acceleration of the mixing, the merged droplet was shuttled back and forth. Recirculation in a moving droplet was proven to be effective for high-speed mixing in this diffusion-dominated scale. All the handling operations were carried out using air pressure transferred through microfabricated vent valves which were newly developed. The demonstrated strategy, including fabrication, leads to high-performance and low-cost micro total anal. systems (μTAS).

```
=> log y
STN INTERNATIONAL LOGOFF AT 14:21:57 ON 18 FEB 2004
```

=> d his

(FILE 'HOME' ENTERED AT 08:03:17 ON 18 FEB 2004)
FILE 'CA' ENTERED AT 08:04:14 ON 18 FEB 2004

```
L1     576 S (REPLICA? OR IMPRESS? OR MICROFABRIC? OR MICROMACHIN?)(5A)MOLD?
L2     235 S L1 AND(ELASTOMER? OR ELASTIC OR RUBBER OR PDMS OR DIMETHYLSILOXANE OR SILOXANE
OR POLYMERIC)
L3     118 S L2 NOT PY>2000
L4    7439 S MICROFLUID? OR(MICRO OR MU)(1A)(TOTAL OR TAU)
L5      29 S L2 AND L4
L6       9 S L5 NOT PY>2000
L7      65 S L2,L5 AND PATENT/DT AND PY<2002
L8      11 S L1 AND L4 NOT L2
L9   34000 S (REPLICA? OR IMPRESS? OR MICROFABRIC? OR MICROMACHIN? OR CAST? OR STAMP? OR
EMBOSS?)(5A)(MOLD? OR LITHOGRAPH?)
L10   3689 S L9 AND(ELASTOMER? OR ELASTIC OR RUBBER OR PDMS OR DIMETHYLSILOXANE OR SILOXANE
OR POLYMERIC)
L11     43 S L4 AND L10
L12      7 S L9 AND(ELASTOMER? OR ELASTIC OR RUBBER OR PDMS OR DIMETHYLSILOXANE OR SILOXANE
OR POLYMERIC)(7A)(PUMP OR VALVE)
L13     80 S L10 AND(ELECTROSPRAY OR NOZZLE OR CAPILLARY)
L14     57 S L11-13 NOT PY>2000
L15     25 S L11-13 AND PATENT/DT AND PY<2002
L16    189 S L3,L6-8,L14-15
L17    178 S L16 NOT(PLASTER OR ELECTROFORM OR OPHTHALM? OR ALGINATE)
L18    171 S L17 NOT(BIOFOUL? OR ELECTROMAG? OR MELTING SPRAYING OR LEATHER)
L19    153 S L18 NOT(DENTAL OR COLLAGEN)
```

=> d bib,ab 1-153

L19 ANSWER 20 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 134:194162 CA
TI Current status of micro molding technology
AU Hanemann, Thomas; Heckele, Mathias; Piotter, Volker
CS Forschungszentrum Karlsruhe, Karlsruhe, 76021, Germany
SO Polymer News (2000), 25(7), 224-229
AB A review with 13 refs considers micro system technol. and the related spin-off products as one of the key technologies at the beginning of the new millennium. The essential condition for market success of micro systems is the cost-effective prodn. of microstructures in large scales. In the last few years different plastic molding techniques like hot embossing and injection molding which are suitable process technologies for small and large scale fabrication have been adapted for the necessities of micro component fabrication. This overview article will cover the current status of the various non-silicon micro molding techniques including new rapid prototyping and manufg. as well as recent developments focusing on the fabrication of microcomponents made from ceramic or metal materials.

L19 ANSWER 21 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 134:186917 CA
TI Implementation and analysis of **polymeric replication** by micro-injection **molding**
AU Shah, Jatan; Su, Yu-Chuan; Lin, Liwei
CS Center for Integrated Microsystems Department of Mechanical Engineering and Applied Mechanics, The University of Michigan, Ann Arbor, MI, 48109, USA
SO Micro-Electro-Mechanical Systems (1999), 1, 235-301
AB Injection **molding** technique for the **replication** of **polymeric** microstructures is demonstrated. By means of appropriate process control, traditional injection molding technique can be applied for the replication of **polymeric** microstructures. Using wet-etched silicon wafers as mold inserts, the authors have successfully predicted, improved, and optimized the replication results. The behavior of polymer melt in micro mold cavity was characterized by both exptl. and simulation results. Temp. parameters are identified as the key factors that decisively det. the quality of molded microstructures. Optimization of the

molding process was performed using simulation and expt. evaluation approach. This technique has potential applications for MEMS fabrication at relatively lower cost with a short cycle time. The authors believe this adoption of the injection molding process to micro-fabrication will lead to a promising technique for MEMS devices.

L19 ANSWER 23 OF 153 CA
AN 134:148618 CA
TI Continuous gel casting method and apparatus
IN Champagne, James T.
PA USA
SO U.S., 33 pp.
PI US 6187250 B1 20010213 US 1998-136525 19980819 <--
PRAI US 1998-136525 A 19980819
AB The title app. comprises: (a) means for introducing a gel-forming mixt. into a reaction space in which a formulation reservoir delivers the reaction mixt. through **nozzles** to one vertical edge of the **molding** space, (b) a **casting** manifold enclosing the reaction space, (c) means for formulating a vertical gradient of compn., (d) venting means, (e) means for initiation of polymn., (f) means for temp. control, (g) means for removing polymd. gel from the molding space, (h) means for cutting the gel, (i) means for removing excess gel, and (j) means for stacking the cut gels. The app. and method allows one skilled in the art to make either gradient or non-gradient slab gels continuously so that the produced gels are uniformly formed, polymd. and cut to a specific size as needed, in a mass-produced, assembly line manner.

L19 ANSWER 27 OF 153 CA
AN 134:112349 CA
TI From micro- to nanofabrication with soft materials
AU Quake, Stephen R.; Scherer, Axel
CS Department of Applied Physics, MS 128-95, California Institute of Technology, Pasadena, CA, 91125, USA
SO Science (Washington, D. C.) (2000), 290(5496), 1536-1540
AB A review with 35 refs.Soft materials are finding applications in areas ranging from **microfluidic** device technol. to nanofabrication. We review recent work in these areas, discuss the motivation for device fabrication with soft materials, and describe applications of soft materials. In particular, we discuss active **microfluidic** devices for cell sorting and biochem. assays, **replication- molded** optics with subdiffraction limit features, and nanometer-scale resonators and wires formed from single-mol. DNA templates as examples of how the special properties of soft materials address outstanding problems in device fabrication.

L19 ANSWER 28 OF 153 CA
AN 134:83093 CA
TI Microfabricated injector and **capillary** array assembly for high-resolution and high throughput separations of DNA for sequence analysis
IN Liu, Shaorong
PA USA
SO PCT Int. Appl., 41 pp.
PI WO 2001004613 A1 20010118 WO 2000-US18134 20000630 <--
US 6533914 B1 20030318 US 2000-604861 20000627
PRAI US 1999-142735P P 19990708
AB The present invention concerns methods and app. for the high resoln., high output electrophoretic sepn. of mols. In preferred embodiments, the methods and app. are of use for DNA sequencing. The app. comprises a hybrid device, comprising a microfabricated chip injector attached to an array of one or more **capillaries**. The chip injector is designed with incorporation and injector channels that precisely match the **capillaries**, to minimize or eliminate dead vol. in the system. DNA sequencing runs of over 700 bases, with a run time of less than one hour, may be accomplished with the methods and app. disclosed herein.

L19 ANSWER 31 OF 153 CA
AN 133:275674 CA
TI Formation and active mixing of metered nano/picoliter liquid droplets in a **microfluidic**

device
AU Hosokawa, Kazuo; Fujii, Teruo; Endo, Isao
CS Mechanical Engineering Laboratory, AIST/MITI, Tsukuba, 305-8564, Japan
SO Micro Total Analysis Systems 2000, Proceedings of the μTAS Symposium, 4th, Enschede, Netherlands, May 14-18, 2000 (2000), 481-484. Editor(s): Van den Berg, Albert; Olthuis, W.; Bergveld, Piet. Publisher: Kluwer Academic Publishers, Dordrecht, Neth.
AB This article presents a **microfluidic** device for formation and active mixing of two liq. droplets with a predefined 600 pL vol. for each. Exptl. back-and-forth action of the merged droplet effectively accelerates the micromixing. All the operations were carried out using air pressure applied through the hydrophobic microcapillary vents, which the authors developed and reported previously. The **microfluidic** device was fabricated through a simple process using the polydimethylsiloxane **replica molding** technique. The demonstrated methodol. is potentially applicable to multistep **micro total** anal. systems.

AN 133:136235 CA
TI Fabrication of Topologically Complex Three-Dimensional **Microfluidic** Systems in **PDMS** by Rapid Prototyping
AU Anderson, Janelle R.; Chiu, Daniel T.; Jackman, Rebecca J.; Cherniavskaya,Oksana; McDonald, J. Cooper; Wu, Hongkai; Whitesides, Sue H.; Whitesides, George M.
CS Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, 02138, USA
SO Analytical Chemistry (2000), 72(14), 3158-3164
AB This paper describes a procedure for making topol. complex three-dimensional **microfluidic** channel systems in poly(**dimethylsiloxane**) (**PDMS**). This procedure is called the "membrane sandwich" method to suggest the structure of the final system: a thin membrane having channel structures molded on each face (and with connections between the faces) sandwiched between two thicker, flat slabs that provide structural support. Two "masters" are fabricated by rapid prototyping using two-level photolithog. and **replica molding**. They are aligned face to face, under pressure, with **PDMS** prepolymer between them. The **PDMS** is cured thermally. The masters have complementary alignment tracks, so registration is straightforward. The resulting, thin **PDMS** membrane can be transferred and sealed to another membrane or slab of **PDMS** by a sequence of steps in which the two masters are removed one at a time; these steps take place without distortion of the features. This method can fabricate a membrane contg. a channel that crosses over and under itself, but does not intersect itself and, therefore, can be fabricated in the form of any knot. It follows that this method can generate topol. complex **microfluidic** systems; this capability is demonstrated by the fabrication of a "basketweave" structure. By filling the channels and removing the membrane, complex microstructures can be made. Stacking and sealing more than one membrane allows even more complicated geometries than are possible in one membrane. A square coiled channel that surrounds, but does not connect to, a straight channel illustrates this type of complexity.

AN 132:331470 CA
TI Room-Temperature Imprinting Method for Plastic Microchannel Fabrication
AU Xu, Jingdong; Locascio, Laurie; Gaitan, Michael; Lee, Cheng S.
CS Department of Chemistry and Biochemistry, University of Maryland, College Park, MD, 20742, USA
SO Analytical Chemistry (2000), 72(8), 1930-1933
AB A new plastic imprinting method using a silicon template is demonstrated. This new approach obviates the necessity of heating the plastic substrate during the stamping process, thus improving the device yield from ~10 devices to above 100 devices per template. The dimensions of the imprinted microchannels were found to be very reproducible, with variations of less than 2%. The channel depths were dependent on the pressures applied and the materials used. Rather than bonding the open channels with another piece of plastic, a flexible and adhesive poly(**dimethylsiloxane**) film is used to seal the microchannels, which offers many advantages. As an application, isoelec. focusing of green fluorescence protein on these plastic **microfluidic** devices is illustrated.

AN 132:294644 CA
TI New developments in injection molding of plastic microparts
AU Piotter, V.; Muller, K.; Norajitra, P.; Ruprecht, R.; Hausselt, J.
CS Forschungszentrum Karlsruhe GmbH, Institut fur Materialforschung III, Karlsruhe, Germany
SO Werkstoffwoche '98, Band I: Symposium 1, Werkstoffe fuer die Informationstechnik; Symposium 12, Mikrosystemtechnik, Munich, Sept., 1998 (1999), Meeting Date 1998, 291-296. Editor(s): Kempter, Karl; Hausselt, Juergen. Publisher: Wiley-VCH Verlag GmbH, Weinheim, Germany.
LA German
AB A review with 13 refs. Injection molding processes for the fabrication of plastic microparts are described and their differences to conventional molding techniques are outlined. The application of the finite-element programs ABAQUS and MOLDFLOW for the process optimization is reported. Special techniques are also described, like 2-component injection molding, injection molding with inlaid parts, reactive injection molding, and injection molding with subsequent electroforming. A microdiaphragm pump made from polysulfone and a component for a microspectrometer made from polymethylmethacrylate are given as application examples.

L19 ANSWER 42 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 132:191277 CA
TI Polymer microfabrication methods for **microfluidic** analytical applications
AU Becker, Holger; Gartner, Claudia
CS Jenoptik Mikrotechnik, Jena, D-07745, Germany
SO Electrophoresis (2000), 21(1), 12-26
AB A review with 64 refs. A growing no. of microsystem technol. (MST) applications, particularly in the field of **microfluidics** with its applications in the life sciences, have a need for novel fabrication methods which account for substrates other than silicon or glass. We present in this paper an overview of existing polymer microfabrication technologies for **microfluidic** applications, namely replication methods such as hot embossing, injection molding and casting, and the technologies necessary to fabricate the molding masters. In addn., techniques such as laser ablation and layering techniques are examd. Methods for bonding and dicing of polymer materials, which are necessary for complete systems, are evaluated.

L19 ANSWER 44 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 132:162935 CA
TI Patterning proteins and cells using soft lithography
AU Kane, Ravi S.; Takayama, Shuichi; Ostuni, Emanuele; Ingber, Donald E.; Whitesides, George M.
CS Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, 02138, USA
SO Biomaterials (1999), 20(23/24), 2363-2376
AB This review with 88 refs. describes the patterning of proteins and cells using a non-photolithog. **microfabrication** technol., which we call "soft **lithog.**" because it consists of a set of related techniques, each of which uses stamps or channels fabricated in an **elastomeric** ("soft") material for pattern transfer. The review covers three soft lithog. techniques: microcontact printing, patterning using **microfluidic** channels, and laminar flow patterning. These soft lithog. techniques are inexpensive, are procedurally simple, and can be used to pattern a variety of planar and non-planar substrates. Their successful application does not require stringent regulation of the lab. environment, and they can be used to pattern surfaces with delicate ligands. They provide control over both the surface chem. and the cellular environment. We discuss both the procedures for patterning based on these soft lithog. techniques, and their applications in biosensor technol., in tissue engineering, and for fundamental studies in cell biol.

L19 ANSWER 53 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 131:103066 CA
TI Fabrication of polymer microcomponents with the AMANDA-process
AU Schomburg, W. K.; Ahrens, R.; Bacher, W.; Martin, J.; Saile, V.
CS Forschungszentrum Karlsruhe, Institut fur Mikrostrukturtechnik, Karlsruhe, D-76021,

Germany
SO Eurosensors XII, Proceedings of the 12th European Conference on Solid-State Transducers and the 9th UK Conference on Sensors and Their Applications, Southampton, UK, Sept. 13-16, 1998 (1998), Volume 1, 711-714. Editor(s): White, N. M. Publisher: Institute of Physics Publishing, Bristol, UK.
AB The AMANDA-process combines surface **micromachining**, **molding** and transfer of a diaphragm for fabrication of microcomponents from polymers. Molding and batch processing facilitate low-cost mass prodn. with AMANDA. Long-term reliability, lifetime, and high prodn. yields have been demonstrated. **Microfluidic** components such as pumps, valves, and sensors for pressure and flow have been fabricated with AMANDA; an extension to other microdevices is straight forward.

L19 ANSWER 55 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 130:268155 CA
TI Manufacturing of micro-components for new applications in chemistry by injection molding of polymers
AU Callenbach, Tilo
CS Medical Components Department, H. Weidmann A.-G. Plastics Technology, Rapperswil, CH-8640, Switz.
SO Chimia (1999), 53(3), 72-74
AB A brief review with 9 refs. The Weidmann company (Germany) has set up a unique injection-**molding** tool for **replication** of optical and non-optical microstructures down to a sub-μm scale. This approach simplifies the initial tooling and, thus, substantially lowers the cost threshold for feasibility studies and testing of injection-molded microstructures. Two case studies, with micropipets and a micro-spectrometer, resp., show the usefulness of this new process technol. The service for polymer sample prototyping is available on a com. basis at reasonable costs and turn-around times.

L19 ANSWER 60 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 129:296763 CA
TI AMANDA - low-cost production of **microfluidic** devices
AU Schomburg, W. K.; Ahrens, R.; Bacher, W.; Goll, C.; Meinzer, S.; Quinte, A.
CS Inst. Mikrostrukturtechnik, Forschungszentrum Karlsruhe, Karlsruhe, D-76021, Germany
SO Sensors and Actuators, A: Physical (1998), A70(1-2), 153-158
AB AMANDA is a process that allows the prodn. of **microfluidic** devices by **molding** of the device housings, surface **micromachining** of a diaphragm, and transferring it to the molded parts. Various devices have been produced bu using AMANDA, and the reliability of the process was proven in a small-scale prodn. line for the manuf. of micropumps having a yield of 70%. Low-cost prodn. is achieved by batch fabrication of the polymer devices. A further redn. of expenditure appears to be feasible by miniaturizing the devices and enlarging the batches. Long-term investigations show that the diaphragms of pumps and valves may stand ≥300 million deflections. For example, one micropump pumped unfiltered room air for nearly half a year at 20 Hz. During all tests, no defect in a valve and no clogging of the pump occurred. In any case of failure, the pumps were damaged by a crack in the heater of the thermo-pneumatic actuator. Folds in the diaphragm appear to be responsible for these cracks.

L19 ANSWER 63 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 129:223077 CA
TI Soft lithography
AU Xia, Younan; Whitesides, George M.
CS Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, 02138, USA
SO Annual Review of Materials Science (1998), 28, 153-184
AB Soft lithog. represents a nonphotolithog. strategy based on self-assembly and **replica molding** for carrying out micro- and nano-fabrication. It provides a convenient, effective, and low-cost method for the formation and manufg. of micro- and nanostructures. In soft **lithog.**, an **elastomeric stamp** with patterned relief structures on its surface is used to generate patterns and structures with feature sizes ranging from 30 nm to 100 μm. Five techniques were demonstrated: micro-contact printing (μCP), **replica molding** (REM), micro-

transfer **molding** (μTM), micro-molding in **capillaries** (MIMIC), and solvent-assisted micro-molding (SAMIM). In this chapter the authors discuss the procedures for these techniques and their applications in micro- and nano-fabrication, surface chem., materials science, optics, MEMS, and microelectronics. A review, with 184 refs.

L19 ANSWER 73 OF 153 CA
AN 127:270321 CA
TI Soft lithography
AU Xia, Younan; Whitesides, George M.
CS Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, 02138, USA
SO Polymeric Materials Science and Engineering (1997), 77, 596-598
AB "Soft lithog." is the collective name for a group of non-photolithog. techniques that are currently being explored in our lab. for fabricating high-quality micro- and nano-structures. We have already demonstrated: micro-contact printing, **replica molding**, micro-transfer **molding**, micro-**molding** in **capillaries** and solvent-assisted micro-contact molding. These techniques employ **elastomeric stamps** (or **molds**) with patterned relief structures on their surfaces to generate micropatterns of self-assembled monolayers (SAMs) by contact printing and to form microstructures of org. polymers by **replica molding**. They require remarkably little in capital investment and can be carried out in an ambient lab. at low cost. This paper briefly discusses the procedures for these techniques, and their applications in the fabrication of meso-scale patterns and structures of various materials with dimensions in the range of ~30 nm to 500 μm. A review with 20 refs.

L19 ANSWER 75 OF 153 CA
AN 127:227181 CA
TI Soft lithographic methods for nano-fabrication
AU Zhao, Xiao-Mei; Xia, Younan; Whitesides, George M.
CS Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, 02138, USA
SO Journal of Materials Chemistry (1997), 7(7), 1069-1074
AB A review, with 97 refs., including microcontact printing, **replica molding**, and micromolding, is given. Soft lithog. is a low-cost, non-photolithog. strategy for carrying out micro- and nano-fabrication. This unconventional approach consists of techniques based on self-assembly and **replica molding** of org. mols. and **polymeric** materials. Four such techniques, microcontact printing (μCP), **replica molding**, micromolding in **capillaries** (MIMIC), and microtransfer molding (μTM), have been demonstrated for the fabrication of patterns and structures of a variety of materials with dimension ≥ 30 nm. This review describes these techniques and their applications in fabrication and manufg. at the sub-100 nm scale.

L19 ANSWER 77 OF 153 CA
AN 127:136921 CA
TI Stability of molded polydimethylsiloxane microstructures
AU Delamarche, Emmanuel; Schmid, Heinz; Michel, Bruno; Biebuyck, Hans
CS IBM Research Division, Zurich Research Laboratory, Rueschlikon, CH-8803, Switz.
SO Advanced Materials (Weinheim, Germany) (1997), 9(9), 741-746
AB The stability of features in **elastomeric** stamps were examd. with respect to their formation and subsequent application for microcontact printing and micromolding in **capillaries**. A model system comprising stamps formed from masters of Novalac resin patterned by photolithog. on Si wafers and liq. poly(**dimethylsiloxane**) (**PDMS**) as replication media was used. The masters had raised lines 0.8 μm in width, which formed depression in the **PDMS** replicas, sepd. by 1.2 μm wide lines of exposed, fluorinated silica. A width of 1.2 μm for the lines in the **elastomeric** stamp was formed by photolithog. and hence readily permitted the use of several masters with different thicknesses of photoresist. The results showed, that the stability of molded lines in **PDMS** is affected by their aspect ratio, their handling, and aspects of their application. Gravity, adhesion, and hydrodynamics exert stresses on the **elastomer** that confound defect-free pattern transfer by causing the collapse or deformation of the **elastomer**'s features.

L19 ANSWER 81 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 126:285185 CA
TI Extending Microcontact Printing as a Microlithographic Technique
AU Xia, Younan; Whitesides, George M.
CS Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, 02138, USA
SO Langmuir (1997), 13(7), 2059-2067
AB This paper describes a no. of approaches that have been employed to reduce the size of features of self-assembled monolayers (SAMs) generated using microcontact printing (μCP). In μCP, an **elastomeric** stamp is used to print patterned SAMs of alkanethiolates on the surfaces of coinage metals and SAMs of alkylsiloxanes on Si/SiO2. It is a convenient technique for generating patterned microstructures with feature sizes ≥ 500 nm. The capability of this technique could be extended to produce features smaller than 500 nm using the following approaches: (1) μCP with mech. deformation of the **elastomeric** stamp-i.e., with lateral compression or uniaxial stretching in the plane of the stamp and with pressure perpendicular to the plane of the stamp; (2) μCP with phys. alternation of the **elastomeric** stamp-i.e., with a stamp that has been swelled with a solvent or a stamp whose dimensions have been reduced by extn. of an inert filler; (3) μCP with redn. in the size of features resulting from processes taking place on the surface-i.e., lateral reactive spreading of hexadecanethiol on gold; and (4) μCP with multiple impressions on the same surface. The advantages and disadvantages of each approach are evaluated and compared in this paper.

L19 ANSWER 82 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 126:212943 CA
TI **Replica molding** using **polymeric** materials. A practical step toward nanomanufacturing
AU Xia, Younan; McClelland, Jabez J.; Gupta, Rajeev; Qin, Dong; Zhao, Xiao Mei; Sohn, Lydia L.; Celotta, Robert J.; Whitesides, George M.
CS Department Chemistry Chemical Biology, Harvard University, Cambridge, MA, 02138, USA
SO Advanced Materials (Weinheim, Germany) (1997), 9(2), 147-149
AB **Replica molding** of org. polymers against masters with nm-sized relief features on their surface is described as a practical procedure for fabrication of structures with feature sizes <50 nm. An **elastomeric** poly(**dimethylsiloxane**) **molding** was **replicated** from a Cr master and was used as master for the re-replication with rigid polyurethane to produce nanostructures similar to those of the original master. Surface structures were imaged using at. force microscopy.

L19 ANSWER 102 OF 153 CA COPYRIGHT 2004 ACS on STN
AN 118:114440 CA
TI Laser-chemical three-dimensional writing for microelectromechanics and application to standard-cell **microfluidics**
AU Bloomstein, T. M.; Ehrlich, D. J.
CS Lincoln Lab., Massachusetts Inst. Technol., Lexington, MA, 02173-9108, USA
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (1992), 10(6), 2671-4
AB A high-speed technique was developed for machining three-dimensional silicon parts using laser-induced chlorine etching reactions. Parts are created directly from solid-modeling computer-aided-design/computer-aided-manufg. software. Removal rates exceeding 2x104 and >105 μm3/s are achieved at 1 and 15 μm x-γ resoln., resp. This is several orders of magnitude faster than electrodischarge machining methods. Submicrometer resoln. was achieved. Laser-induced metalization of resulting structures as well as **replication** through compression **molding** have been demonstrated. A class of **microfluidic** flow-channel devices is under development using a std.-cell software architecture combined with field switching.

=> log y
STN INTERNATIONAL LOGOFF AT 08:51:22 ON 18 FEB 2004

=> d his

(FILE 'HOME' ENTERED AT 13:33:45 ON 17 FEB 2004)
FILE 'CA' ENTERED AT 13:33:55 ON 17 FEB 2004

```
L1     454 S (ELASTOMER? OR ELASTIC OR RUBBER OR PDMS OR DIMETHYLSILOXANE OR SILOXANE OR
POLYMERIC)(4A)PUMP?
L2     558 S (ELASTOMER? OR ELASTIC OR RUBBER OR PDMS OR DIMETHYLSILOXANE OR SILOXANE OR
POLYMERIC)(4A)VALVE
L3      27 S L2 AND L1
L4     815 S L1,L2 NOT PY>2000
L5       9 S L4 AND PERISTALTIC(3A)PUMP?
L6       2 S L4 AND PNEUMAT?(3A)PUMP?
L7     291 S L1/TI,IT,ST
L8     381 S L2/TI,IT,ST
L9     526 S L4 AND L7-8
L10     53 S L9 AND(FLUID? OR MICROFLUID? OR NANO? OR MICROMACHIN? OR MICROFABRIC?)
L11 22697 S (ELASTOMER? OR ELASTIC OR RUBBER OR PDMS OR DIMETHYLSILOXANE OR SILOXANE OR
POLYMERIC)(4A)(LAYER OR SUBSTRATE)
L12     18 S L4 AND L11
L13    735 S L4 NOT L5-6,L10,L12
L14      8 S L13 AND(PRESSURE CONTROL OR CHANNEL)
L15    114 S L3,L5-6,L10,L12,L14

=> d bib,ab 1-114
```

L15 ANSWER 3 OF 114 CA
AN 138:381481 CA
TI Rapid prototyping of **microfluidic** components
AU Jackson, William C.; Leger, Wayne; Lopez, Gabriel P.; Tran, Hy D.
CS Dept. of Chem. & Nuc. Eng., University of New Mexico, Albuquerque, NM, 87131, USA
SO Proceedings of the Annual Meeting - American Society for Precision Engineering, 15th, Scottsdale, AZ, United States, Oct. 22-27,2000 (2000), 588-591 Publisher: American Society for Precision Engineering, Raleigh, N. C.
AB **Microfluidic** devices are receiving considerable attention in the fabrication of micro-electro-mech. systems for biotechnol. applications (e.g. BioMEMS). Microscale total anal. systems can reduce cost and increase speed of anal., esp. through reduced use of reagents and reduced system size. A key factor in developing new **microfluidic** applications is the development of prototyping technologies for fabricating and testing new system designs that incorporate **fluidic** networks, microreactors, sepn., and detection systems. One technique for fabricating **microfluidic** networks is based on replica molding of microchannels with poly(di-Me siloxane) (PDMS). Microchannel networks with feature size down to 5 μm have been demonstrated with PDMS replica molding. PDMS replica molding can fabricate microchannel networks with a turnaround period of hours to days using inexpensive, bench-top equipment. However, valves and pump technologies are still macro-scale (e.g. external syringe **pumps**, **peristaltic pumps**, or power supplies for electro-osmotic pumps). We present a rapid prototyping technique for fabrication of **microfluidic** networks and active components (e.g. **valves**) based on **PDMS** replica molding combined with magnetic actuation. This technique allows embedding of magnetically actuated, mech. active polymers within the PDMS microchannel network. By activating the microchannels, the channels may be closed or opened (e.g. valving action). Multiple valves and reservoirs may be actuated in order to create **pumping** via **peristaltic** action. Magnetic actuation may be achieved by incorporating a magnetically active material into the PDMS (whether permanent magnet, or high permeability material), and applying an external magnetic field from a printed circuit board. Both valves and pumps have been demonstrated. Using inexpensive bench-top equipment, we can fabricate actual devices with sizes on the order of a few millimeters, with channel sizes on the order of a few hundred micrometers. We have demonstrated active valves that close leak-tight, and withstand back pressures on the order of 1.5 kPa.

L15 ANSWER 5 OF 114 CA
AN 137:7898 CA
TI Manufacturing method of microfabricated **elastomeric valve** and **pump** systems and operating method thereof
IN Unger, Marc A.; Chou, Hou-Pu; Thorsen, Todd A.; Scherer, Axel; Quake, Stephen R.; Liu, Jian; Adams, Mark L.; Hansen, Carl L.
PA California Institute of Technology, USA

SO PCT Int. Appl., 176 pp.

PI	WO 2002043615	A2	20020606	WO 2001-US44549	20011128
PRAI	US 2000-724784	A	20001128		
	US 2001-826583	A	20010406		
	US 1999-141503P	P	19990628		
	US 1999-147199P	P	19990803		
	US 2000-186856P	P	20000303		
	WO 2000-US17740	W	20000627		
	WO 2001-US44549	W	20011128		

AB A method of fabricating an elastomeric structure comprises: forming a first elastomeric layer on top of a first micromachined mold, the first micromachined mold having a first raised protrusion which forms a first recess extending along a bottom surface of the first elastomeric layer; forming a second elastomeric layer on top of a second micromachined mold, the second micromachined mold having a second raised protrusion which forms a second recess extending along a bottom surface of the second elastomeric layer; bonding the bottom surface of the second elastomeric layer onto a top surface of the first elastomeric layer such that a control channel forms in the second recess between the first and second elastomeric layers; and positioning the first elastomeric layer on top of a planar substrate such that a flow channel forms in the first recess between the first elastomeric layer and the planar substrate.

L15 ANSWER 11 OF 114 CA COPYRIGHT 2004 ACS on STN
AN 133:239810 CA
TI A high pressure-resistance micropump using active and normally-closed valves
AU Shinohara, Jun; Suda, Masayuki; Furuta, Kazuyoshi; Sakuhara, Toshihiko
CS Seiko Instruments Inc., Chiba, 270-2222, Japan
SO Annual International Conference on Micro Electro Mechanical Systems, Proceedings, 13th, Miyazaki, Japan, Jan. 23-27, 2000 (2000), 86-91 Publisher: Institute of Electrical and Electronics Engineers, New York, N. Y.
AB A novel micropump that has two active and normally-closed valves was developed by using **micromachine** technol. This micropump can pump in forward and backward direction, and hold the **fluid** without consuming energy even when the **fluid** source has some pressure. This normally-closed valve is manufd. in the way of filling up silicone **rubber** paste after bonding glass **substrate** and silicon substrate. This silicone rubber works as a "gate" for shutting off the flow. Therefore, high pressure-resistance micropump is realized with no influence of fabrication error. In this paper, basic characteristics of this micropump about flow rate, outlet pressure and pressure-resistance are described.

L15 ANSWER 13 OF 114 CA COPYRIGHT 2004 ACS on STN
AN 133:91094 CA
TI A practical thermopneumatic valve
AU Grosjean, Charles; Yang, Xing; Tai, Yu-Chong
CS Caltech Micromachining Lab, Caltech, Pasadena, CA, 91125, USA
SO IEEE International Conference on Micro Electro Mechanical Systems, Technical Digest, 12th, Orlando, Fla., Jan. 17-21, 1999 (1999), 147-152 Publisher: Institute of Electrical and Electronics Engineers, New York, N. Y.
AB Previously, we reported a thermopneumatic silicone **rubber** membrane **valve**. This valve combined thermopneumatic actuation with a low modulus silicone rubber membrane. However, the leakage of the working **fluid** through the membrane rendered the valve unusable in a day or two. Here, we present extensive optimization and characterization of a redesigned valve structure. This new design has a suspended membrane heater optimized for low power consumption, a composite silicone rubber on Parylene membrane that exhibits low permeability and modulus, and a novel valve seat designed to improve sealing in the presence of particles. The valve has been extensively characterized with respect to power consumption vs. flow rate and transient response. Very low power consumption has been demonstrated. For example, less than 40 mW is required to switch a one slpm nitrogen flow at 33 psi. Water requires close to 100 mW due to the cooling effect of the liq. The previously reported valve required more than 280 mW to switch a similar air flow.

L15 ANSWER 17 OF 114 CA COPYRIGHT 2004 ACS on STN
AN 132:335689 CA

TI Design, fabrication, and testing of **micromachined** silicone **rubber** membrane **valves**
AU Yang, Xing; Grosjean, Charles; Tai, Yu-Chong
CS Caltech Micromachining Laboratory, Department of Electrical Engineering, California Institute of Technology, Pasadena, CA, 91125, USA
SO Journal of Microelectromechanical Systems (1999), 8(4), 393-402
AB Technologies for fabricating silicone rubber membranes and integrating them with other processes on silicon wafers have been developed. Silicone rubber has been found to have exceptional mech. properties including low modulus, high elongation, and good sealing. Thermopneumatically actuated, normally open, silicone **rubber** membrane **valves** with optimized components have been designed, fabricated, and tested. Suspended silicon nitride membrane heaters have been developed for low-power thermopneumatic actuation. Composite silicone **rubber** on Parylene **valve** membranes have been shown to have low permeability and modulus. Also, novel valve seats were designed to improve sealing in the presence of particles. The valves have been extensively characterized with respect to power consumption vs. flow rate and transient response. Low power consumption, high flow rate, and high pressure have been demonstrated. For example, less than 40 mW is required to switch a 1-slpm nitrogen flow at 33 psi. Water requires close to 100 mW due to the cooling effect of the liq.

L15 ANSWER 24 OF 114 CA COPYRIGHT 2004 ACS on STN
AN 128:193445 CA
TI **Fluid valve** with **elastomeric** diaphragm
IN Farrell, Gregory A.; Hanmann, Kevin J.; Schmitz, Peter; Behringer, Bruce E.; Mawhirt, James A.
PA Bayer Corp., USA
SO Pat. Specif. (Aust.), 18 pp.

PI	AU 684997	B2	19980108	AU 1995-32926	19950927
	AU 9532926	A1	19960418		
PRAI	US 1994-319918		19941007		

AB A valve, used in unified **fluid** circuits for clin. diagnostic analysts for haematol., chem., chem. and immunol. (no data), comprises a first rigid layer having a planar first surface, a second rigid layer having a planar second surface facing the first surface and a planar third surface opposite the second surface, and a flexible layer positioned between the first and second surfaces. , wherein the three layer comprise acrylic plastics. A valve chamber is demarcated by a concave surface in the planar first surface and one surface of the flexible layer and ≥1 first **fluid** passageway in the first rigid layer opens into the valve chamber at the concave surface to alternatively apply a vacuum and pressure. A **fluid** chamber is demarcated by another surface of flexible layer and a concave-convex surface in the planar second surface which comprises an inner circular convex portion and a concentric annular outer concave portion. ≥2 **Fluid** passageways in the second rigid layer open into the valve chamber at the convex surface.

L15 ANSWER 25 OF 114 CA COPYRIGHT 2004 ACS on STN
AN 128:76456 CA
TI A MEMS thermopneumatic silicone **rubber** membrane **valve**
AU Yang, Xing; Grosjean, Charles; Tai, Yu-Chong; Ho, Chih-Ming
CS Department of Electrical Engineering, California Institute of Technology, Pasadena, CA 91125, USA
SO Sensors and Actuators, A: Physical (1998), A64(1), 101-108
AB A technol. for fabricating silicone rubber membranes and integrating them with other processes on a silicon wafer was developed. Silicone rubber has been found to have exceptional mech. properties, including low Young's modulus, high elongation, and good sealing. An integrated normally open **valve** using a silicone **rubber** membrane and PF5060 liq. for thermopneumatic actuation was fabricated and tested. For a 1.34 L/min air flow, 280 mW power input is required to close the valve at 20 psi inlet pressure. Due to the high permeability of silicone rubber, most liqs. used in thermopneumatic systems will be lost, necessitating more work to find a suitable barrier material compatible with silicone rubber.

=> log y
STN INTERNATIONAL LOGOFF AT 13:52:06 ON 17 FEB 2004